

THE EFFECTS OF RIPENESS AND CURING
RATES ON THE FREE AMINO ACIDS OF
FLUE-CURED TOBACCO

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ABSTRACT

Cured-leaf samples of Coker 319 that had been harvested at one of three stages of ripeness and subsequently cured either "fast" or "normally" or "slowly" with respect to yellowing time were analyzed for 29 "free" amino acids (defined on the basis of extractability with 1/100 HCl) or other ninhydrin-positive substances. Rather large differences, approaching 40-fold for certain constituents, were observed. Of the imposed variables, the differences associated with degree of ripeness were larger and more consistent; 27 constituents decreased with advancing ripeness (24 significantly) while only 2 showed no change. During curing, 16 constituents decreased (7 significantly) with prolonged yellowing while 11 increased (7 significantly). With regard to stalk position, 12 of the amino acids were higher in bottom primings than in the top but lowest in the middle of the stalk; twelve other constituents increased linearly up the stalk. Relative prevalences will be discussed from the viewpoints of metabolism, protein synthesis and proteolysis.

REVIEW BY E. J. DESZYCK

The picking times of the leaf samples studied were estimated by leaf color, being a week early for the unripe leaf, at optimum picking time and one week past maturity. The leaf quality was maximum at optimum time of harvest. The curing times were 3/4 time of normal, normal, and 5/4 time of normal for fast cure. The unripe fast cured leaf still had green color.

The effects of curing schedules and ripeness on the free amino acids are shown in the four tables. Results for aspartic acid are found in Table 1.

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Table 1
Overall Treatment Effects on Aspartic Acid (μg per gm)

		Curing Schedule			Ripeness Means
		Fast	Normal	Slow	
R	Under-Ripe	539	551	645	579
I	Ripe	341	338	414	364
P	Over-Ripe	225	247	273	249
E	Curing Means	369	379	444	

Position Means:	Top	312	Constituents Responding
	Middle	281	Similarly: Lysine, Histidine, Ammonia, STAG ¹ , Glutamic
	Bottom	598	Acid, Glycine

¹serine, tryptophane, alanine, and glutamine

With ripeness, an inverse relationship was apparent, since the unripe leaf had the highest and the over-ripe the lowest amounts of this acid. With curing, a linear relationship is apparent. Most aspartic acid is present in the slow cure and least in the fast cure. The bottom leaves of the stalk were highest and the top leaves lowest in the amino acids listed in Table 1.

In general, the effect of ripeness on α -amino adipic acid, proline, and their associated amino acids follows the same trend as does the effect of ripeness on valine (Tables 2, 3, 4). With curing, proline follows the same trend as does aspartic acid. However, for both α -amino adipic acid and valine the trend is reversed, being highest for the fast cure and lowest for the slow cure (Tables 2, 3). The valine relationship, in regard to position of the leaves on the stalk, is similar to that for aspartic acid, but for α -amino adipic acid and proline the trend is reversed, the highest levels being found in the top leaves and the lowest in the bottom leaves (Tables 3, 4).

Eventually, the tobaccos of various curing times, degrees of ripeness, and stalk positions will be evaluated as to smoke flavor.

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Table 2
Overall Treatment Effects on Valine (μg per gm)

Ripeness		Curing Schedule			Ripeness Means
		Fast	Normal	Slow	
	Under-Ripe	266	216	194	225
	Ripe	167	152	134	151
	Over-Ripe	135	81.4	91.4	102
	Curing Means	189	150	140	

Position Means:	Top	84.7	Similar Response From:
	Middle	97.4	Arginine, Cystine, Isoleucine,
	Bottom	296	Leucine, Phenylalanine ⁺ , γ-Aminobutyric Acid

Table 3
Overall Treatment Effects on α-Aminoadipic Acid (ug per gm)

Ripeness		Curing Schedule			Ripeness Means
		Fast	Normal	Slow	
	Under-Ripe	308	315	259	294
	Ripe	276	287	201	255
	Over-Ripe	231	238	231	233
	Curing Means	272	280	230	

Position Means:	Top	324	Similar Response From:
	Middle	293	L ₃ , L ₄ , L ₅ , Alanine, Tyrosine,
	Bottom	165	Homocystine, Galactosamine, L ₁₁ , L ₁₂

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Table 4

Overall Treatment Effects on Proline (ug per gm)

Ripeness	Curing Schedule			Ripeness Means
	Fast	Normal	Slow	
Under-Ripe	4870	5910	6390	5720
Ripe	3430	4340	4950	4240
Over-Ripe	2090	2960	3680	2910
Curing Means	3460	4400	5010	

Position Means: Top 7930 Similar Response From:
 Middle 2640 Hydroxyproline
 Bottom 2310

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